

ENGINEERING DIRECTIVE
Chief Engineer

OBSOLETE

This directive establishes and defines CADD policy for users of AutoDesk AutoCAD software in the Department. Attached hereto is a document entitled "AutoCAD Requirement for translation to GDS". For any District project that may, in whole or in part, be translated into GDS, these requirements are to be followed in their entirety. Projects of this nature include bridge projects, projects involving the Boston Layouts Section, projects which will be worked on by Boston based staff, and projects that may be given to a consulting firm for additional work.

To insure consistency throughout the Department, all projects, whether intended for translation to GDS or not, shall follow the "AutoCAD Layer Listing" contained in the Appendix to the attached document.

This policy will be effective for all files created on or after July 19, 1993. Work in progress will not be affected.

May 25, 1993

AutoCAD Requirements for Translation to GDS

- 1.) *AutoCAD Drafting Requirements*
- 2.) *DXF File Requirements*
- 3.) *Sample Submission Requirements*
- 4.) *Final Submission Requirements*
- 5.) *Appendix*

Designers shall comply with the following requirements to ensure the smooth, accurate and complete translation of all DXF files into the Department's GDS CADD system. Consultants are directed to contact the MHD Director of CADD prior to beginning a project to obtain the latest CADD requirements concerning layer/block naming conventions, linestyles and characterstyles.

1.) AUTOCAD DRAFTING REQUIREMENTS

- All final Contract Drawings and Record Drawings containing proposed planimetric features defined by or tied to the Massachusetts State Plane Coordinate System shall be created on a CADD System on the level of accuracy and precision specified in the Massachusetts Highway Design Manuals. A minimum of three Massachusetts State Plane Coordinate System reference points shall be clearly marked and labeled on all of these drawings.
- AutoCAD SYMBOLS used shall be created as blocks and shall conform to the discipline symbology shown in the "Preparation of plans" Section of the Highway Design Manual.
- AutoCAD Layers shall be named according to the layer name listing contained in the attached appendix. Only graphics described by the layer name shall be contained on that layer as these graphics will later be converted to AutoCAD blocks. Consultants having an existing layer name listing procedure which is similar but does not exactly match the listing contained in the appendix may submit their listing to the Director of CADD for approval prior to any DXF file submissions.

A single drawing sheet may be composed of more than one drawing type. In these cases, the layer names used shall be the ones corresponding to the drawing types contained in the sheet.

- DIMENSION LINES, extension lines and dimension text shall appear on the same layer as specified in the layer listing table. Dimension lines shall be mapped to an appropriate GDS dimension linestyle. See sheet LINE04 in attached appendix. Dimension lines shall be extended through the end mark (arrowhead, tickmark, etc.) to the extension lines. Do not break dimension lines.
- LEADERLINES shall be created with the DIM LEADER command and on the proper layer as specified in the layer listing table. Leader lines shall be mapped to an appropriate GDS leader line linestyle. See sheets LINE03 & LINE04 in the attached appendix. The leader line must be extended to the arrow tip. Do not break leader lines.

- END MARKS such as arrowheads, points, and tick marks shall be placed on a separate layer. This layer shall be deleted prior to generation of DXF file.
 - PLINE thickness is ignored by the translator and translated as constant width. If a thick line is required, use a hatched rectangle or a solid fill linetype instead.
 - Only the following special symbols may be used in AutoCAD text blocks:
 - 1.) %%d (Degrees Symbol)
 - 2.) %%p (Plus/Minus Symbol)
 - 3.) %%c (Diameter Symbol)
 - 4.) %% (Percent Sign)
- All other special symbols are not to be used.
- TEXT JUSTIFICATION will be at lower left, unless noted otherwise.
 - TEXTSTYLES shall not use an oblique angle nor be defined to run backwards or upside down. Also, text shall not be created using the fit option.
 - SOLID FILL in AutoCAD does not translate as a filled GDS block. The outline of the AutoCAD solid is translated but the fill is ignored. To successfully translate as a filled solid, the AutoCAD linetype used to draw the solid outline must be mapped to the appropriate GDS filled linestyle in the linestyle mapping table. This linestyle mapping table is described in the final submission requirements section.
 - DIFFERENTIAL SCALING (different X and Y scales) in AutoCAD drawings shall not be used.
 - DOUGHNUTS are translated as circles, with a diameter midway between the "inside" and "outside" diameters used when the doughnut was created. Doughnuts should not be used.
 - SHAPES are ignored by the translator. This is because SHAPES are stored in an external file, not in the DXF file. Use "BLOCKS" instead of SHAPES.
 - Do not use BYBLOCK colors or linetypes.
 - POINT entities do not translate correctly and shall not be used.

- ❶ AUTOCAD ATTRIBUTE DATA do not translate correctly and shall not be used.
- ❷ AUTOCAD AUXILIARY FILES shall not be used. Each DXF file shall contain all data for that drawing.

2.) DXF FILE REQUIREMENTS

The following are the requirements for the preparation of an AutoCAD Drawing Exchange Format (DXF) file.

- ❸ Converting AutoCAD layers to AutoCAD blocks

It is required that all AutoCAD graphics contained in the DXF file be contained in AutoCAD blocks. Therefore, prior to generation of a DXF file, all non-block entities shall be converted to AutoCAD blocks, deriving their block name from the AutoCAD layer on which they reside. If the designer wishes to keep the graphics as non-block entities, it is suggested that the designer "quit" the AutoCAD session after generation of the DXF file, thereby discarding all changes made during that session.

- ❹ Invisible layers/unused data

Prior to generation of a DXF file, invisible layers not essential to the drawings, (layers that are either frozen or turned off when the drawing is plotted), shall be deleted and the drawing shall be PURGED to rid the file of unused data. If this information will be needed at a later time, it is suggested that the designer "quit" the AutoCAD session after generation of the DXF file, thereby discarding all changes made during that session. In addition, if graphics are contained outside the plotted window of the drawing, these shall also be deleted prior to generation of the DXF file.

- ❺ AutoCAD "Handles"

All AutoCAD "handles" shall be destroyed before generation of DXF files.

- ❻ DXF FILENAMES

DXF filenames shall contain a maximum of eight characters with the first two characters being the letters SH.

The remaining characters shall be the sheet number from the title block at the top of the drawing sheet.

For example, the DXF filename for an AutoCAD drawing of sheet number 24 would be SH24.DXF.

3.) SAMPLE SUBMISSION REQUIREMENTS

- 1.) Sample DXF files may be required. In these cases, DXF files may be submitted on floppy disks compatible with MS-DOS. If file compression software was used (e.g PKZIP), this software, as well as all information necessary to restore the files shall be provided. A hard copy corresponding to each DXF file shall be submitted.
- 2.) A listing of all DXF files submitted shall be provided. This listing shall contain the name of each DXF file, the plotting scale used to create the accompanying hard copy for each DXF file, as well as Autocad drawing units used (feet or inches) for each DXF file. (See description of the tape information file under Final Submission Requirements)
- 3.) A file containing the linestyle mapping table is required. For a description see "Mapping Tables" under the Final Submission Requirements section.
- 4.) A file containing the characterstyle mapping table is required. For a description, see "Mapping Tables" under the Final Submission Requirements section.

4.) FINAL SUBMISSION REQUIREMENTS

AutoCAD DXF files shall be submitted on 9 track 1600 BPI magnetic reel tape, or TK-50 or TK-70 cartridges in VMS backup format fully compatible with and readable by the VAX/VMS Version 5.5-2 (or current) operating system. In addition to the DXF files, a tape information file, a linestyle mapping table file, and a characterstyle mapping table file as described below, shall be submitted.

TAPE INFORMATION FILE

When files are submitted on tape, there shall be one line in the tape information file for every DXF file on the submitted tape. Each line of the tape information file will be composed of three fields. Each field has a variable length and is separated from its adjacent field by a space.

Each field shall contain the following information:

- o Field #1: DXF filename

This field contains the DXF filename.

- o Field #2: Drawing scale

The field contains the AutoCAD drawing scale.
This is the scale used when the AutoCAD drawing is plotted in a non-dimensional format.

- o Field #3: AutoCAD Drawing Unit

This field contains the number of mm in one AutoCAD drawing unit.

A sample tape information file is shown below.

Example:

	SH12	2400	304.8	
	SH13	480	25.4	
DXF Filename	<—			>—
Drawing Scale	<—			

Number of mm in an AutoCAD Drawing unit. Use either 25.4 if drawing units are inches, or 304.8 if drawing units are feet.

MAPPING TABLES

Mapping tables are required to control how AutoCAD linetypes, text styles and colors are translated to GDS. The mapping tables are text files created using the operating system text editor. These mapping tables shall be submitted with DXF files. Sample mapping tables are shown at the end of this document.

■ LINESTYLE MAPPING TABLE

The linestyle mapping table will be used to specify how an AutoCAD linetype will be mapped to a GDS linestyle. The mapping table is divided into three fields. Field one contains the name of the AutoCAD linetype, field two contains the AutoCAD color number used by that linetype, and field three contains the GDS linestyle name.

The available GDS linestyles are shown in the Appendix. The mapping table shall be created by listing all AutoCAD linetypes, the corresponding color number, and the appropriate GDS linestyle name selected from the table in the Appendix.

The mapping table may contain any number of AutoCAD linetypes, regardless of whether they are all used on each DXF file. Therefore, only one linestyle mapping table is required for each project.

Consultants using customized AutoCAD linetypes which do not match any of the GDS linestyles listed in the appendix may submit these linetypes to the MHD Director of CADD prior to using them on a project. These linetypes will be translated, and if successful, the appropriate GDS linestyles will be made available for use in the linestyle mapping table.

■ CHARACTER STYLE MAPPING TABLE

The character style mapping table will be used to specify how an AutoCAD text font will be mapped to a GDS character style. The mapping table is divided into three fields. Field one contains the name of the AutoCAD text font, field two contains the AutoCAD color number used with that text font, and field three contains the GDS character style name. The mapping table shall be created by listing all AutoCAD text fonts, the corresponding color number, and the appropriate GDS characterstyle name selected from the table in the Appendix. The mapping table may contain any number of AutoCAD text fonts, regardless of whether they are all used on each DXF file. Therefore, only one character style mapping table is required for each project.

The available GDS characterstyles are shown in the attached Appendix. The mapping of the AutoCAD font/color number combination to one of the displayed styles should be based on the desired style appearance and pen weight, and not on the actual size of the text blocks. AutoCAD users should be aware that the current version of the translator uses the first eight characters from the font specification as a search string when looking through the mapping table. Therefore, when the font specification includes the file extension, the first eight characters used by the translator could include part of the file extension. (Ex. if font is specified as ROMANS.SHX the translator will search the mapping table for fonts ROMANS.S not ROMANS)

For this reason it is suggested that the font file extension is not included in the definition of AutoCAD character styles. If it is included, the 8 character limit should be taken into consideration in the preparation of the characterstyle mapping table.

APPENDIX

- *Sample Linestyle Mapping Table*
 - *Sample Characterstyle Mapping Table*
 - *Available GDS Linestyles*
 - *Available GDS Characterstyles*
 - *AutoCAD Layer Listing*
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